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RESILIENT PLASTIC FASTENER WITH STRUT SUPPORTED LEGS

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The present invention relates to novel fastener devices, and, more particularly, to novel fasteners of the type generally referred to as drive fasteners.

An important object of the present invention is to provide a novel fastener device adapted to be applied to an apertured work structure, which fastener device comprises a shank portion that may be relatively easily radially collapsed for facilitating application thereof to the work structure, the shank portion at the same time effectively resisting radially collapsing when forces are applied to the fastener tending to remove the fastener from the work structure whereby the fastener has highly desirable holding characteristics.

Another object of the present invention is to provide a novel fastener of the above described type which is of simple one-piece construction whereby to permit the fastener to be economically produced by molding or by severing successive fasteners from an extruded strip of stock material.

Another object of the present invention is to provide a novel fastener which requires reduced amounts of stock material while still having highly desirable holding characteristics.

A more specific object of the present invention is to provide a novel drive fastener constructed so that shank elements thereof may be relatively easily radially inwardly collapsed for facilitating application to a work structure, and also so that the shank elements have a relatively high resistance to axial collapsing so as to reduce any possibility of injury to the fastener while it is being driven into the work structure.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawing wherein:

Fig. 1 is a perspective view showing a fastener device embodying one form of the present invention;

Figs. 2, 3 and 4 are partial sectional views respectively showing the fastener device of Fig. 1 in various stages of assembly with a work structure;

Fig. 5 is a side view showing a modified form of this invention;

Fig. 6 is a side view showing a further modified form of the invention;

Fig. 7 is a side view showing another modified form of the present invention;

Fig. 8 is a fragmentary plan view of a strip of extruded stock material from which fastener devices of the present invention may be severed;

Fig. 9 is a side view showing another modified form of the present invention;

Fig. 10 is a side view showing still another modified form of the present invention;

Figs. 11 and 12 are respectively different side views of a fastener device embodying a further modified form of the present invention;

Fig. 13 is a side view showing another modified form of the present invention;

Fig. 14 is a side view showing still another modified form of the present invention;

Fig. 15 is a sectional view taken along line 15—15 in Fig. 14;

Figs. 16 and 17 are, respectively, a side view and an entering end view of a fastener device embodying still another modified form of the present invention; and

Fig. 18 is a cross sectional view taken along line 18—18 in Fig. 11.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, a drive fastener 20 embodying features of the present invention is shown in Figs. 1 through 4. The fastener 20 is formed in one piece, preferably from resilient plastic material, and comprises a head portion 22 and a generally axially extending shank portion 24. In this embodiment a work engaging face 26 of the head portion is generally rectangular and has an elongated relatively narrow configuration.

The shank portion 24 comprises a pair of opposed generally axially extending elements 28 and 30 which are substantially spaced radially from opposite sides of the longitudinal axis of the fastener. Each of the elements 28 and 30 has a narrow width substantially equal to the minor dimension of the work engaging face 26. In addition, each of the elements 28 and 30 has a relatively thin radial dimension so that these narrow and thin resilient elements may be radially flexed or collapsed relatively easily during application of the fastener to an apertured work structure. Preferably entering end portions 32 and 34 of the shank elements 28 and 30 converge toward each other and are integrally joined.

Shoulder or prong means 36 and 38 are spaced axially along the shank elements 28 and 30 respectively. Each of these shoulder or prong means has a cam surface 40 disposed toward the entering end of the fastener for facilitating passage of the fastener through a work structure aperture. Each of these shoulder means also has a shoulder or work engaging surface 42 facing toward the head portion 26 and extending radially outwardly and inclined slightly toward the head portion.

In order to provide the shank elements 28 and 30 with relatively great resistance to radial collapsing under the influence of forces tending to remove the fastener from a work structure while enabling the elements 28 and 30 to collapse radially during application of the fastener to the work structure, the shank portion is provided with a plurality of axially spaced ribs or strut elements 44. Opposite ends of each of the strut elements 44 are respectively integrally joined to the shank elements 28 and 30 at locations substantially in radial alignment with a pair of shoulder or prong means 36 and 38. The resilient strut elements 44 are relatively thin and flexible and are formed so that they are initially curved or bowed axially of the fastener.

The fastener device 20 is adapted to be applied to any suitable work structure, which, for example, may include a pair of work pieces or panel members 46 and 48, respectively, having apertures 50 and 52 therethrough. It will be appreciated that the spacing of the shoulder means or prongs axially of the shank portion adapts the fastener for application to work structures of various thicknesses. The fastener may be easily applied to the apertured work structure merely by forcing it axially through the aligned apertures as shown in Fig. 3. As the shank portion passes through the aperture, successive increments of the elements 28 and 30 and successive rib or strut elements 44 are radially collapsed sufficiently to permit the shoulder means or prongs to pass through the workpiece aperture.

The curved or bowed formation of the ribs or strut elements promotes radial collapsing of the shank portion